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University of Maine.

Maine Agricultural Experiment Station

ORONO

BULLETIN No. 209.

JANUARY, 1913

NEW MINERAL FERTILIZER

This bulletin contains the account of an experiment in which corn and potatoes were grown without fertilizer, with ordinary commercial fertilizers, and with so-called New Mineral Fertilizer. The yields were the smallest where New Mineral Fertilizer was used, a little larger where no fertilizer of any kind was used, and much larger yields were obtained with regular manures.

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AGRICULTURAL EXPERIMENT STATION
ORONO, MAINE.

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BULLETIN No. 209.

NEW MINERAL FERTILIZER.*

Chas. D. Woods.

For the past three years a material called at first New England Mineral Fertilizer and later New Mineral Fertilizer has been extensively advertised in New England. This advertising is of the persuasive kind and has led and may lead to still further sales at about three quarters of a cent a pound of a material which in its composition is exactly what they claim it to be, ground rock. It is this likelihood of the money of the farmer going to the coffers of the company for a material that is nearly destitute of available plant food that makes necessary the publication in the following pages of a matter that were it not for the persistent advertising might be disposed of in two pages or less. In their advertising the Company keeps within the existing laws of this State. If a bill aimed against false and misleading advertising that is now being considered by the Maine Legislature should be enacted into law it is possible that something might be done. But that is doubtful, for their advertising is ingenious and guarded. For example, they compare the analysis of the ground rock they call New Mineral Fertilizer with the analysis of a soil that produces good crops and point out the resemblances. They do not dwell upon the differences. They have the same kind of testimonials from users that are so familiar to the reader of patent medicine advertisements. But many have found the use of the goods disappointing with results similar to those here reported. Such instances are not reported in the company's advertisements.

* This experiment was planned by the writer. The field work was executed under the direction of Mr. Sinclair. The notes were taken by Mr. Bonns.

In 1910 the New England Mineral Fertilizer Company registered New England Mineral Fertilizer in Maine under the fertilizer law. The following is quoted from the annual report of the fertilizer inspection for 1911:*

"NEW ENGLAND MINERAL FERTILIZER.

Occasionally during the past 25 years there have been zealous advocates of the use of ground rock as a fertilizer. Soil is formed by the weathering of rocks by the slow processes of time. Dreamers, and it is to be earnestly hoped their dreams may some time come true, have in their imagination seen the stone walls that encumber so many New England fields converted by mechanical and chemical processes into forms available for the production of fruit, grain, hay, roots and tubers for the food of man and other animals.

In 1909 the American Health Association of Clifton, New Jersey, published a most remarkable 100-page pamphlet entitled "The Fertility of the Soil and Life or Death. A Treatise on the Use of Lava and its Influence on the Evolution of Plants, Animals and Men," by the "Professor of Polaric Nutrition at the Divine Science University." After a number of pages which are apparently designed to befog the mind of the reader, several different brands of lava such as the Mount Pelee Brand, Mount Vesuvius Brand, the Coma Brand, Chimborazo Brand for Trees, the Etna Brand for Sandy Soils, are exploited. In most of the descriptions it is ingeniously suggested that these various brands of lava be used in connection with barnyard manure or else upon rich soils. The Department of Agriculture of the American Health Association were willing to part with these brands for prices varying from \$15.00 to \$30.00 per ton. f. o. b. Passaic, New Jersey.

In 1910 the New England Mineral Fertilizer and Chemical Company of Boston, Mass., were licensed to sell in Maine New England Mineral Fertilizer which was guaranteed to contain no nitrogen or ammonia, a trace of available phosphoric acid.

* Maine Agricultural Experiment Station, Official Inspections 29. January 1911.

a trace of total phosphoric acid and a trace of potash. When the application for the license was received, the question naturally came up as to whether such a material could be licensed under the fertilizer law of the State. The law applies to "any material used for a fertilizing purpose, the price of which exceeds ten dollars a ton." As this was quoted at \$15.00 a ton in carload lots and \$17.00 per ton in less than carload lots, it seemed to come within the definition of the law. It will be noted that the goods make no claim for the presence of plant food as obtains in ordinary fertilizing materials, and as is contemplated by the law.

They have apparently issued a good deal of descriptive literature. In these publications considerable reference is made to the work of the "Professor of Polaric Nutrition at the Divine Science University," although he is not given his official title, so far as noted, in the publications of the New England Mineral Fertilizer Company.

There are probably no claims made for the composition of these goods that are not borne out by fact. They do, however, make claims for the performance of this so-called fertilizer many of which are contrary to exact experiments that have been obtained with this class of materials. It is not a new thing to attempt to fertilize land with ground rock. Feldspar which contains a large amount of potash has been used repeatedly in scientific experiments with no substantial results. It is impossible to quote at any length from the absurd literature which is used in advertising these goods. One claim—"No fear of burning the plants with this fertilizer"—is probably correct.

The writer has no knowledge of the sales that were made in Maine in 1910 of these goods with the single exception of a lot which was sold to Mr. A. J. Orf of North Bradford. When Mr. Orf received the goods he wrote to the Experiment Station about having them analyzed. He was informed that no doubt the goods would carry what they claimed to—that is, not any of the ordinary plant food materials, but would contain an abundance of the constituents of rocks quite similar to those present in his field. On receipt of the letter from the Experiment Station Mr. Orf was naturally indignant with the company and wrote them a strong letter. They, however, persuaded him to make a trial of the Mineral Fertilizer and he wrote them

in October, enclosing a slip taken from the Bangor Commercial, showing that he had taken the first premium on pumpkins and cucumbers at the Charleston Fair, grown by the use of New England Mineral Fertilizer. Naturally the company were elated at this testimony and sent to the writer a series of letters, including the one which he had written Mr. Orf, which they proposed to publish to show the value of the New England Mineral Fertilizer and the ignorance of Experiment Station people.

On receipt of this communication the writer at once wrote Mr. Orf asking for particulars as to soil, methods of treatment, etc., and also asking the best way to get to his place in order that the land where this marvel was produced might be seen. October 21 Mr. Orf wrote that he grew the pumpkins and took the prize at Charleston. These were grown "on New England Mineral Fertilizer with a light *coat of manure*." He also says: "My potatoes I say nothing about, only ten bushels from two rows 25 rods long." And again: "The company wants me as an agent but I won't swindle the public." Further on he says: "You will see by my letter that it is no use to come up here."

As stated above, it is lawful so far as the fertilizer law is concerned for this company to sell this material under the claims that they do that it is free from nitrogen and contains a trace of the two other constituents of commercial fertilizers that are required by law to be stated on the package. If the fertilizer law were as broad as the food and drug law these goods would be mislabeled if accompanied by such statements as are made in the literature which these people distribute.

In 1910 the Experiment Station had about three acres at Highmoor Farm on which oats were grown without fertilizer. The object of this was to test the natural uniformity of the land and see how well it is suited for plot experiments. It is planned in 1911 to use a part of this field in an experiment to test the Mineral Fertilizer on potatoes and corn. Six-tenths of an acre will be set aside for this purpose and laid out into six plots. Two of these plots will be unfertilized, two will be fertilized with Mineral Fertilizer in accordance with the directions for the particular crop to be obtained from the New England Mineral Fertilizer and Chemical Company, one of the remaining plots will be fertilized at the rate of 1500 to 1800 pounds per acre with a high grade fertilizer, and the other plot

will be fertilized at the rate of eight cords of manure and 500 pounds of fertilizer to the acre. One of the unfertilized plots will be planted to sweet corn, the other to potatoes. One of the plots manured with Mineral Fertilizer will be planted to sweet corn, the other to potatoes. The plot with 1500 to 1800 pounds of high grade fertilizer will be planted to potatoes, and the one with manure and fertilizer to sweet corn."

PLANNING THE EXPERIMENT.

Prior to the publication of Official Inspections 29 correspondence was begun with the New England Mineral Fertilizer and Chemical Company relative to the experiment outlined in the preceding paragraph. Under date of January 2 the president of the company wrote:

"Yours of the 23rd at hand. We are more than pleased to know that you have concluded to give us a fair show. We shall ship you free of cost whatever amount of fertilizer you desire for this experiment. The same will be identical in analysis with the product which we are to put out the coming season. You stated in your letter that you wished to make an experiment on six plots. All that we ask is that you use an equal number of pounds of our fertilizer in competition with the best fertilizer that you can get on the market."

January 3 the Director of the Maine Agricultural Experiment Station wrote the New England Mineral Fertilizer and Chemical Company as follows:

"Your letter of January 2 is at hand. In the proposed test of Mineral Fertilizer we shall use the equivalent of 360 pounds of a high grade fertilizer carrying 4 per cent nitrogen, 8 per cent of available phosphoric acid and 7 per cent of water soluble potash. We will use the same amount of Mineral Fertilizer or any amount which you will suggest. When you get ready to send the New England Mineral Fertilizer please ship it to the Maine Agricultural Experiment Station, Monmouth, Maine, and notify me at Orono of the shipment. I note your offer that you will furnish this New England Mineral Fertilizer free. We, however, are ready to pay for it. Kindly send bill when the goods go forward to me here at Orono."

February 27, 1911, the president of the New England Mineral Fertilizer and Chemical Company again wrote as follows:

"We are shipping you, as directed, 100 pounds of our Mineral Fertilizer. After reading your very flattering remarks on our fertilizer in Official Inspections 29 we have concluded that it would be advisable for this company to send a representative to see this fertilizer applied. So if you will inform us when you are ready to make your test we will send a man to see the fertilizer put on and we will also send a man at different periods during the season so that we may stand at least a small show of getting fair treatment." Much of the remainder of the letter is personal abuse and the following is the only part which bears upon the proposed experiment as it indicates that they knew when they sent the 100 pounds of fertilizer for the plots exactly what was to be used on the other plots. "It is very self evident from the tests which you lay down in your bulletin which you are going to make with this Mineral Fertilizer and the quantity of what you call high grade fertilizer and the large quantity of stable manure, together with the large amount of chemical fertilizer that you intend putting against this worthless, good for nothing, ground rock which in your judgment is poorer than ordinary dirt, that you are afraid of some of the statements which you have made otherwise you would not wish to corral a large percentage of the fertilizer in your vicinity to dope up your soil for fear that you would be beaten in the coming test which you say you are going to make."

March 7 this letter was acknowledged as follows:

"Your letter of February 27 and 100 pounds of your fertilizer received. I will notify you as far in advance as I can of the time of the experiments with potatoes and corn on which Mineral Fertilizer is to be used will be stated. There will have to be two different plantings, as the potatoes will have to be planted earlier than it is safe to plant corn with us. The farm is open to visitors at all times and you or your representatives will always be welcome."

May 23 the following letter was written to the New England Mineral Fertilizer and Chemical Company:

"I have to leave to day for a week or ten days absence. The plots have been selected for the experiment with the New Eng-

land Mineral Fertilizer and laid out and full directions have been left relative to the plans with Mr. Bonns, our horticulturist, who is at Highmoor Farm, and Mr. Sinclair, the superintendent of the farm. The plots will probably be planted during my absence, and you will be notified as far in advance as practicable of the exact date when the planting will be done."

All six of the plots were planted on May 30 in the presence of a representative of the company. At that time the representative claimed that not a sufficient amount of Mineral Fertilizer was being used, and this matter was pointed out in a letter from the company under date of June 2.

Under date of June 5 the following letter was sent to the New England Mineral Fertilizer Company :

"Your letter of June 2 is at hand. We will gladly use all the New England Mineral Fertilizer on the plots where we are using it that you desire to be added. When I wrote you December 23, 1910, outlining the experiment I thought that we would make a tenth acre of each plot and, therefore, asked you to send the needed amount of New England Mineral Fertilizer to fertilizer one-tenth of an acre of potatoes and one-tenth of an acre of corn, asking that it be shipped to the Experiment Station at Monmouth. We received from you one bag which contained considerably less than 100 pounds. You did not send any directions for its use but said that you would have a representative present at the time of planting. * * * * * We will add any further amount of your fertilizer on the plots on which it is used that you may wish to send to the Experiment Station at Monmouth. My thought in the letter of December 23 was to have you fertilize the plots which were to be grown with the New England Mineral Fertilizer exactly as you wanted them. In the last sentence of the first paragraph of your letter of June 2 you say 'It seems to me that the test which you are giving our fertilizer is extremely unfair.' I have compared the report of your representative with your letter of December 23 and do not see wherein they differ in any essentials with the exception that the size of the plots was changed to one-twentieth of acre instead of one-tenth of an acre, as originally planned. If the unfairness consists in using a too little amount of the New England Mineral Fertilizer I

do not feel that we were to blame for that and we are ready to correct it in any way that you suggest. If there are other particulars in which the experiment seems to you to be unfair I would be glad to have them stated in definite form. I had supposed that the plans of the experiment were agreed to by your company."

Under date of June 8 the company wrote:

"Yours of recent date received, and in answer will say that we doubt very much if it would do any good to put on Mineral Fertilizer this late in the season to the plot of ground in question at the experiment farm unless we had plenty of rain. We note that on Plot D you have used 60 pounds of Armour 4-8-7 in the drill and intend to apply 30 pounds more later, making 90 pounds of what you call high grade fertilizer. Now against this plot you have used only 40 pounds of our Mineral Fertilizer and we think that this is hardly a fair test considering in your estimation that Mineral Fertilizer is poorer than ordinary soil." The letter then proceeds to make similar comparisons on other plots, and concludes: "We think this is a very unfair test. However, it is too late to make any changes and we will have to await the results."

June 10 the company were written as follows:

"Your letter of June 9 is at hand. Frankly I do not like its tenor. It seems to me to be an evasive letter. December 1910 I wrote you outlining the experiment which I planned to put in effect provided you desired to have it carried out. I wrote you at that time exactly how much fertilizer we intended to use on the plots that we were going to fertilizer with commercial fertilizer and farm manure. The experiment was planted exactly as outlined there, with the exception that we used one-twentieth acre plots instead of one-tenth acre plots, as outlined in my letter of December. Relative to the amounts of the Mineral Fertilizer which were to be used, that was left, as you will find in that letter, entirely to your discretion. I told you that there were to be two tenth acre plots. I asked you to furnish Mineral Fertilizer enough for those plots. You sent 100 pounds in a bag which was rather loosely woven so that some of it sifted out in transit. We also took a pint out of the bag for the purpose of chemical analysis. We applied all of the fertilizer which you have sent to the two plots of one-twentieth

acre instead of the two plots of one-tenth acre each, as originally planned. If there was not as much Mineral Fertilizer used as you desired upon the plots it seems to me that the fault is entirely with you. We were ready to apply the fertilizer in any amount which you furnished us. As to your contention that it is too late to apply fertilizer at the present time, that is absurd. Corn is just barely pushing through the ground and had made practically no growth as yet. The same is true of the potatoes. You will note that we are planning to add extra fertilizer to the plots which were planted with chemical fertilizer and farm manure."

No reply was received to this letter and on September 8 they were written that in the near future the crops would be ready for harvesting, and that if they cared to send a representative I would be glad to arrange to be there with him. By later correspondence it was arranged that the crops stay in the field and that the representative of the company should be present Wednesday, September 20, at the harvesting of the potatoes and the corn.

At the time when the representative of the New Mineral Fertilizer Company was present at harvesting he said that in his judgment altogether too little Mineral Fertilizer was used, that while he recognized that the company was at fault in this matter it was through their misunderstanding, he supposed. He had nothing to do with the planning of the experiments originally, or the passing upon the experiment as outlined.

It was arranged with him that the results of the present season (1911) should not be published, that we would repeat the experiment on exactly the same land again on 1912, that they were to furnish what Mineral Fertilizer they wanted to be applied either in the fall or in the spring as they deemed best. Under date of October 10 Mr. Yoden, representing the New England Mineral Fertilizer Company wrote: "At the suggestion of Doctor True I am going to ask you if it will be agreeable to you to increase the number of plots in the Mineral Fertilizer experiment. I would like to have you try the experiment on nine plots of potatoes, and the same on corn. Some of these plots we would like to be used with Mineral Fertilizer in connection with stable manure. We will tell you just what amount of manure and fertilizer we would like to have you use if you

decide to increase this experiment. If this increase is agreeable to you I will have sent to you the fertilizer necessary, also instructions as to how we would like to have this used. If the experiment cannot be increased I will send you the necessary fertilizer for the two plots where we had the experiment this year."

October 11 the company was written:

"Mr. Yoden's letter of yesterday is at hand. I would be glad if he would outline more in detail the experiments as he would like to have them if we could increase the number of plots from 6 to 18."

No reply was received to this letter and November 1 attention was again called to the letter of October 10. The following letter was written in reply: under date of November 2:

"In answer to your letter of November 1 I would say that I would advise that you increase the number of plots to give a more thorough trial of the fertilizer." The letter was signed by Mr. McCrellis, per Mr. Gooch.

November 4 we wrote in reply declining to increase the number of plots but said "Kindly send at your convenience to the Maine Agricultural Experiment Station, Monmouth, Maine, as much of the fertilizer as you wish to have used on two twentieth acre plots, one-twentieth to be planted to corn and the other one-twentieth to be planted to potatoes."

No reply was received to this letter and under date of April 11, 1912, they were again written to reviewing the whole circumstance, asking them to send the fertilizer, and stating: "If I do not hear from you by April 20 I shall consider that we can use the plots that have been reserved for this experiment for other purposes and that you do not wish to continue the experiment."

This was the end of the correspondence with the company.

THE EXPERIMENT.

The soil in the field selected for this experiment was medium light rocky loam from which all of the stones had been removed. The subsoil was firm and compact and well retentive of moisture. It had been in grass and orchards for a number of years.

It was plowed and kept in clean culture and seeded to oats in 1910 without the addition of any fertilizer whatever. The object was to test the uniformity of the soil and see if it was adapted to a soil test experiment. The yield of oats was about 30 bushels per acre. The part of the field selected for the experiment was divided into six plots, 62 1-2 feet long and 34.8 feet wide, each plot containing 2175 square feet. The field all had a gentle slope towards the west. The soil was as uniform as it was practicable to select. Commencing from the south the plots were numbered, A, B, C, D, E, and F. Corn was grown on Plots A, B, and C, and potatoes on Plots D, E, and F. Plot A. was fertilized with one-fourth cord of manure and 25 pounds of 4-8-7 fertilizer. Plot B was fertilized with 45 pounds of Mineral Fertilizer. Plot C was a check without fertilizer. Plot D had 90 pounds of a 4-8-7 fertilizer, 60 pounds of which was applied at planting and 30 pounds later. Plot E had 43 pounds Mineral Fertilizer. Plot F was a check without fertilizer. The plots were manured and planted on May 30. The corn was about 18 inches in a row and the rows 36 inches apart, 12 rows in each plot, and five kernels to the hill. The potatoes were 12 inches in the row, rows 32 inches apart, with 13 rows to the plot. The corn was cultivated and hoed seven times between June 17 and July 11. The potatoes were cultivated six times between June 16 and July 11 and were sprayed five times between June 30 and August 17.

June 9 the potatoes were coming about equally on all the plots, and the corn was coming slowly. The corn appeared on Plots B and C a day or two earlier than on A. June 15 Plots B and C had slightly better growth and stand than Plot A. July 3 flowering was beginning on all the potato plots. A had a good growth, B and C noticeably less than A, but were about equal. D had a good growth, E and F less than D and about alike. July 13 A had an excellent growth, B and C were alike but less than A by an estimate of 60 per cent. D had excellent growth, E and F similar to the conditions of B and C. July 26 to July 31 A tasselled out and on August 3 and 4 silked. On August 3 and 4 B and C were beginning to show tassel spikes. August 14 B was tasselled out and on August 17 the pollen was ripened.

The yields were as shown in the following table:

Table Showing Yield of Corn.

Plot.	Fertilizer.	Hills.	Plants.	Total crop pounds.	Corn on ear pounds.
A	Manure	364	871	450	284
B	Mineral	412	1253	145	33
C	None	424	1318	175	43

Table Showing Yield of Potatoes.

Plot.	Fertilizer.	Hills.	Merchantable pounds	Culls pounds.
D	Commercial	499	310	36
E	Mineral	670	210	55
F	None	635	239	46

It will be noted that the plots which contained Mineral Fertilizer yielded in each instance somewhat less than the plots without fertilizer. The differences, however, are too slight to be attributed to the use of the Mineral Fertilizer. The results in this particular experiment, with the amount of fertilizer used, show that there was no appreciable beneficial results from the application of Mineral Fertilizer on this soil and with these two crops. The company's claim that not enough Mineral Fertilizer was used may be valid. They, however, were informed of the nature of the experiment and were asked to send the amount of Mineral Fertilizer that they wished to be used on two tenth acre plots. The amount sent was used on two twentieth acre plots. Their failure to send any fertilizer for the repetition of the experiment in 1912 would seem to indicate that they were content with the delay of a year in the publication of the results of this trial and did not care to have their fertilizer tested against commercial manures.

